

CLAIMS

1. An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (21) so that the reproduction sequence can be designated, comprising:

audio encoding means (24 (11, 12, 13)) that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means (27, 24, 23) that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means (26) that determines an edition point of the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point; and

recording means (23) that records the edition point as registration information onto the recording medium

(21).

2. An audio/video recording method for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (21) so that the reproduction sequence can be designated, comprising:

10 a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

15 a second step (S2) of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

20 a third step (S3) of determining an edition point of the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point; and

25 a fourth step (S4) of recording the edition point as management information onto the recording medium (21).

3. An audio/video reproducing apparatus for reproducing video data and audio data on the basis of reproduction management information from a recording medium (31) on which a video object and management information is recorded by a recording apparatus according to claim 1, comprising:

overlap time calculating means (38) for calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object so as to include the edition point obtained from the reproduction management information;

offset time calculating means (39) that sets the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection point in a designated reproduction sequence, calculates a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

resetting means (37) that resets a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

5 offset means (37, 35) that offsets PTS of an audio frame read from the recording medium (31) in accordance with the calculated audio PTS offset time;

video data reproducing means (34) that reproduces video data reproduced from the recording medium (31)
10 in accordance with video PTS accompanying the video data;

audio frame reproducing means (35) that reproduces an audio frame reproduced from the recording medium (31) in accordance with the offset PTS and, when the audio drop flag shows the predetermined value, controls so
15 as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means (35 (15, 16, 17)) that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the
20 audio frame reproduced by the audio frame reproducing means and outputs an audio signal.

4. An audio/video reproducing method for reproducing video data and audio data on the basis of
25 reproduction management information from a recording medium (31) on which a video object and management information is recorded by a recording method according to claim 2, comprising:

a first step (S12) of calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object so as to include the edition point
5 obtained from the reproduction management information;

a second step (S12) of setting the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection
10 point in a designated reproduction sequence, calculating a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second
15 and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a
20 predetermined condition;

a third step (S13) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

25 a fourth step (S13) of offsetting PTS of an audio frame read from the recording medium (31) in accordance with the audio PTS offset time calculated in the second step (S12);

a fifth step (S14) of reproducing video data that is reproduced from the recording medium (31) in accordance with video PTS accompanying the video data;

a sixth step (S14, S15) of reproducing an audio frame that is reproduced from the recording medium (31) in accordance with the PTS which is offset in the fourth step (S13) and, when the audio drop flag that is output in the third step (S13) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a seventh step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step (S14 and S15).

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5. An audio/video reproducing program for making a computer execute a reproducing method of reproducing video data and audio data on the basis of reproduction management information from a recording medium (31) on which management information including a video object and an edition point in an audio frame is recorded by a recording method according to claim 2, wherein the program makes a computer execute:

a first step (S12) of calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object so as to include the edition point obtained from the reproduction management information;

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a second step (S12) of setting the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection point in a designated reproduction sequence, calculating a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

a third step (S13) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a fourth step (S13) of offsetting PTS of an audio frame read from the recording medium (31) in accordance with the audio PTS offset time calculated;

a fifth step (S14) of reproducing video data that is reproduced from the recording medium (31) in accordance with video PTS accompanying the video data;

a sixth step (S14, S15) of reproducing audio data that is reproduced from the recording medium (31) in accordance with the PTS which is offset in the fourth

step and, when the audio drop flag that is output in the third step (S13) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

5 a seventh step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced in the sixth step and outputting an audio signal.

10 6. An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium so that the reproduction sequence can be designated, comprising:

audio encoding means (24 (11, 12, 13)) that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

20 multiplexing means (24) that multiplexes the audio data and the video data to generate the video object;

control means (24, 26) that controls the multiplexing means (24) so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and

generates a flag indicative of an audio multiplex state at the time of multiplexing by the multiplexing means (24); and

recording means (23) that records the video object
 5 output from the multiplexing means (24) controlled by the control means (24, 26) onto the recording medium (21) together with a flag indicative of the audio multiplex state generated by the control means (24, 26).

10 7. An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part
 15 or in whole onto the recording medium (21) so that the reproduction sequence can be designated, comprising:

audio encoding means (24 (11, 12, 13)) that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio
 20 signal to be recorded and outputs the audio data;

multiplexing means (24) that multiplexes the audio data and the video data to generate the video object;

control means (24, 26) that controls the multiplexing means (24) so that an audio buffer
 25 occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame from the upper limit of a specific audio buffer size, and generates a flag indicative of an audio multiplex state

at the time of multiplexing by the multiplexing means (24);

first recording means (23) that records the video object output from the multiplexing means (24) controlled by the control means (24, 26) onto the recording medium (21) together with a flag indicative of the audio multiplex state generated by the control means (24, 26);

video data changing means (27, 24, 23) that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

means (26) that determines an edition point in an audio frame so that a period of reproducing an audio frame of a video object and a period of reproducing an audio frame in the following video object partly overlap each other around the connection point and edits the audio frames; and

second recording means (23) that records the edition point as registration information onto the recording medium (21).

8. An audio/video recording method of, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in

whole onto the recording medium so that the reproduction sequence can be designated, comprising:

a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded
5 and outputting the audio data;

a second step (S22) of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame
10 from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data; and

a third step (S23) of recording a flag indicative of an audio multiplex state under control of the second step (S22) onto the recording medium (21) together with
15 the video object obtained by multiplexing under the control of the second step (S22).

9. An audio/video recording method of, at the time
20 of recording a set of synchronized video data and audio data as a video object onto a recording medium (21), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (21) so that the
25 reproduction sequence can be designated, comprising:

a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded

and outputting the audio data;

a second step (S22) of controlling so that an audio buffer occupation amount is equal to or less than a value obtained by subtracting a data amount of one audio frame
5 from the upper limit of a specific audio buffer size at the time of multiplexing the audio data and the video data;

a third step (S23) of recording a flag indicative of an audio multiplex state under control in the second
10 step (S22) onto the recording medium (21) together with the video object obtained by multiplexing under control of the second step (S22);

a fourth step (S2) of changing the video data as necessary so that a video frame to be reproduced last
15 in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

a fifth step (S3) of determining an edition point in an audio frame so that a period of reproducing an
20 audio frame of a video object and a period of reproducing an audio frame in the following video object partly overlap each other around the connection point and editing the audio frames; and

a sixth step (S4) of recording the edition point
25 as management information onto the recording medium (21).

10. An audio/video reproducing apparatus for

reproducing video data and audio data on the basis of reproduction management information from a recording medium (31) on which a video object and management information is recorded by a recording apparatus
5 according to claim 7, comprising:

overlap time calculating means (38) that calculates time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object with respect to an
10 edition point in the reproduction management information;

offset time calculating means (39) that sets the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the
15 following video object when the edition point is the first connection point in a designated reproduction sequence, calculates a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS
20 offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be
25 reproduced last in the video object at the time of connection under a predetermined condition;

resetting means (37) that resets a system time clock (STC) of the apparatus so as to seamlessly connect video

frames to be connected at each of connection points of the video objects included in the reproduction sequence;

offset means (37, 35) that offsets PTS of an audio frame read from the recording medium (31) in accordance
5 with the calculated audio PTS offset time;

video data reproducing means (34) that reproduces video data reproduced from the recording medium (31) in accordance with video PTS accompanying the video data;

audio frame reproducing means (35) that reproduces
10 an audio frame reproduced from the recording medium (31) in accordance with the offset PTS and, when the audio drop flag shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

15 audio decoding means (35 (15, 16, 17)) that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced by the audio frame reproducing means (35) and outputs an audio signal.

20 11. The audio/video reproducing apparatus according to claim 3 or 10, wherein when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio
25 frame time, the offset time calculating means (39) calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time, and outputs an audio drop flag

of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection.

5 12. An audio/video reproducing method for reproducing video data and audio data on the basis of reproduction management information from a recording medium (31) on which a video object and management information is recorded by a recording method according
10 to claim 9, comprising:

 a first step (S12) of calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object with respect to an edition point
15 in the reproduction management information;

 a second step (S12) of setting the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection
20 point in a designated reproduction sequence, calculating a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second
25 and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in

the video object at the time of connection under a predetermined condition;

a third step (S13) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

5 a fourth step (S13) of offsetting PTS of an audio frame read from the recording medium (31) in accordance with the audio PTS offset time calculated in the second step (S12);

a fifth step (S14) of reproducing video data that is reproduced from the recording medium (31) in accordance with video PTS accompanying the video data;

15 a sixth step (S14, S15) of reproducing an audio frame that is reproduced from the recording medium (31) in accordance with the PTS which is offset in the fourth step (S13) and, when the audio drop flag that is output in the third step (S13) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

20 a seventh step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step (S14 and S15) and outputting an audio signal.

13. The audio/video reproducing method according to claim 4 or 12, wherein in the second step (S12), when

the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of audio frame time, a value obtained by subtracting the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection is output.

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14. An audio/video reproducing program for making a computer execute a reproducing method of reproducing video data and audio data on the basis of reproduction management information from a recording medium (31) on which management information including a video object, an edition point in an audio frame, and an audio multiplex state is recorded by a recording method according to claim 9, wherein the program makes a computer execute:

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a first step (S12) of calculating time of overlap between an audio frame to be reproduced last in a video object and an audio frame to be reproduced first in the following video object with respect to an edition point in the reproduction management information;

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a second step (S12) of setting the calculated overlap time as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the edition point is the first connection point in a designated reproduction sequence, calculating

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a value obtained by adding the calculated overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the edition point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

a third step (S13) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a fourth step (S13) of offsetting PTS of an audio frame read from the recording medium (31) in accordance with the audio PTS offset time calculated;

a fifth step (S14) of reproducing video data that is reproduced from the recording medium (31) in accordance with video PTS accompanying the video data;

a sixth step (S14, S15) of reproducing audio data that is reproduced from the recording medium (31) in accordance with the PTS which is offset in the fourth step (S13) and, when the audio drop flag that is output in the third step (S13) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a seventh step of performing decoding including

a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step (S14, S15) and outputting an audio signal.

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15. An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (41), recording a reproduction sequence for connecting
10 and reproducing a plurality of video objects in part or in whole onto the recording medium (41) so that the reproduction sequence can be designated, comprising:

audio encoding means (44 (11, 12, 13)) that performs encoding including a window function multiplying process
15 and an orthogonal transformation process on an audio signal to be recorded and outputs the audio data;

video data changing means (48, 44, 43) that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame
20 to be reproduced first in the following video object are reproduced seamlessly at a connection point;

edition point determining means (46) that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced
25 last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point;

overlap time calculating means (47) for calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time; and

5 recording means (43) that records at least the overlap time as management information onto the recording medium (21).

16. An audio/video recording method of, at the time
10 of recording a set of synchronized video data and audio data as a video object onto a recording medium (41), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (41) so that the
15 reproduction sequence can be designated, comprising:

 a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

20 a second step (S42) of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

25 a third step (S3) of determining an edition point in an audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames

and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point;

a fourth step (S44) of calculating time of overlap
5 between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time; and

a fifth step (S45) of recording at least the overlap time as management information onto the recording medium

10 (41).

17. An audio/video reproducing apparatus for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium (51)
15 on which a video object and the reproduction sequence are recorded by a recording apparatus according to claim 15, comprising:

overlap time reproducing means (52) that reproduces the overlap time from the recording medium (51);

20 offset time calculating means (58) that sets the overlap time reproduced from the recording medium as audio PTS offset time to be used at the time of reproducing an audio frame of the following video object when the connection point is the first connection point in the
25 reproduction sequence, calculates a value obtained by adding the overlap time reproduced from the recording medium and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at

the present edition point when the connection point is any of the second and subsequent connection points in the reproduction sequence, and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

resetting means (57) that resets a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

offset means (57, 55) that offsets PTS of an audio frame read from the recording medium (51) in accordance with the calculated audio PTS offset time;

video data reproducing means (54) that reproduces video data reproduced from the recording medium (51) in accordance with video PTS accompanying the video data;

audio frame reproducing means (55) that reproduces an audio frame reproduced from the recording medium (51) in accordance with the offset PTS and, when the audio drop flag shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means (55 (15, 16, 17)) that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced by the audio frame reproducing means (55) and outputs an audio signal.

18. The audio/video reproducing apparatus according to claim 17, wherein when the audio PTS offset time at the calculated connection point is longer than
5 a period of "n" times (where n is 1 or 1/2) of audio frame time, the offset time calculating means (58) calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time, and outputs an audio drop flag
10 of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection.

19. An audio/video reproducing method for
15 reproducing video data and audio data on the basis of a reproduction sequence from a recording medium (51) on which a video object and a reproduction sequence are recorded by a recording method according to claim 16, comprising:

20 a first step of reproducing the overlap time from the recording medium;

a second step (S52) of setting the overlap time reproduced from the recording medium as audio PTS offset time to be used at the time of reproducing an audio frame
25 of the following video object when the connection point is the first connection point in the reproduction sequence, calculating a value obtained by adding the overlap time reproduced from the recording medium and

audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the connection point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

10 a third step (S53) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

15 a fourth step (S53) of offsetting PTS of an audio frame read from the recording medium (51) in accordance with the audio PTS offset time calculated in the second step (S52);

20 a fifth step (S54) of reproducing video data that is reproduced from the recording medium (51) in accordance with video PTS accompanying the video data;

25 a sixth step (S54, S55) of reproducing an audio frame that is reproduced from the recording medium (51) in accordance with the PTS which is offset in the fourth step (S53) and, when the audio drop flag that is output in the third step (S53) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

 a seventh step of performing decoding including

a window function multiplying process and an orthogonal inverse transformation process on the audio frame reproduced in the sixth step (S54 and S55) and outputting an audio signal.

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20. The audio/video reproducing method according to claim 19, wherein in the second step (S52), when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or
10 1/2) of audio frame time, a value obtained by subtracting the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be
15 reproduced last in the video object at the time of connection is output.

21. An audio/video reproducing program for making a computer execute a reproducing method of reproducing
20 video data and audio data on the basis of a reproduction sequence from a recording medium (51) on which a video object and the reproduction sequence is recorded by a recording method according to claim 16, wherein the program makes the computer execute:

25 a first step of reproducing the overlap time from the recording medium;

a second step (S52) of setting the overlap time reproduced from the recording medium as audio PTS offset

time to be used at the time of reproducing an audio frame of the following video object when the connection point is the first connection point in the reproduction sequence, calculating a value obtained by adding the overlap time reproduced from the recording medium and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present edition point when the connection point is any of the second and subsequent connection points in the reproduction sequence, and outputting an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection under a predetermined condition;

15 a third step (S53) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

20 a fourth step (S53) of offsetting PTS of an audio frame read from the recording medium (51) in accordance with the audio PTS offset time calculated;

 a fifth step (S54) of reproducing video data that is reproduced from the recording medium (51) in accordance with video PTS accompanying the video data;

25 a sixth step (S54, S55) of reproducing audio data that is reproduced from the recording medium (51) in accordance with the PTS which is offset in the fourth step (S53) and, when the audio drop flag that is output

in the third step (S53) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a seventh step of performing decoding including
 5 a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced in the sixth step (S54 and S55) and outputting an audio signal.

10 22. An audio/video recording apparatus for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (61), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part
 15 or in whole onto the recording medium (61) so that the reproduction sequence can be designated, comprising:

audio encoding means (64 (11, 12, 13)) that performs encoding including a window function multiplying process and an orthogonal transformation process on an audio
 20 signal to be recorded and outputs the audio data;

video data changing means (69, 64, 63) that changes the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object
 25 are reproduced seamlessly at a connection point;

edition point determining means (66) that determines an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced

last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point;

5 overlap time calculating means (67) for calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time;

 offset time calculating means (68) for, when the
10 connection point is the first connection point in the reproduction sequence, setting the overlap time as audio PTS offset time used at the time of reproducing an audio frame in the video object and, when the connection point is any of the second and subsequent connection points
15 in the reproduction sequence, calculating a value obtained by adding the overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present connection point;
and

20 recording means (63) that records at least the audio PTS offset time as management information onto the recording medium (61).

23. The audio/video recording apparatus according
25 to claim 22, wherein when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of an audio frame period, the offset time calculating means (68)

calculates a value obtained by subtracting the audio frame period from the audio PTS offset time as final audio PTS offset time and outputs an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection, and the recording means (63) records the audio PTS offset time and the audio drop flag as the management information onto the recording medium (61).

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24. An audio/video recording method for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (61), recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (61) so that the reproduction sequence can be designated, comprising:

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a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

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a second step (S62) of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced seamlessly at a connection point;

25

a third step (S63) of determining an edition point in the audio frame so that a period of reproducing an

audio frame to be reproduced last in the video object includes time of the connection point of the video frames and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point;

a fourth step (S64) of calculating time of overlap between the audio frame to be reproduced last and the audio frame to be reproduced first so as to include the connection time;

a fifth step (S65) of, when the connection point is the first connection point in the reproduction sequence, setting the overlap time as audio PTS offset time used at the time of reproducing an audio frame in the video object and, when the connection point is any of the second and subsequent connection points in the reproduction sequence, calculating a value obtained by adding the overlap time and audio PTS offset time at the immediately preceding connection point as audio PTS offset time at the present connection point; and

a sixth step (S66) of recording at least the audio PTS offset time as management information onto the recording medium (61).

25. An audio/video recording method according to claim 24, wherein in the fifth step (S65), when the audio PTS offset time at the calculated connection point is longer than a period of "n" times (where n is 1 or 1/2) of an audio frame period, a value obtained by subtracting

the audio frame period from the audio PTS offset time is calculated as final audio PTS offset time, and an audio drop flag of a predetermined value indicating that it is unnecessary to reproduce an audio frame to be reproduced last in the video object at the time of connection is output and, in the sixth step (S66), the audio PTS offset time and the audio drop flag are recorded as the management information onto the recording medium (61).

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26. An audio/video reproducing apparatus for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium (71) on which a video object and the reproduction sequence is recorded by a recording apparatus according to claim 22 or 23, comprising:

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resetting means (77) that resets a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

20

offset means (77, 75) that offsets PTS of an audio frame read from the recording medium (71) in accordance with the audio PTS offset time which is read from the recording medium (71);

25

video data reproducing means (74) that reproduces video data reproduced from the recording medium (71) in accordance with video PTS accompanying the video data;

audio data reproducing means (75) that reproduces

audio data reproduced from the recording medium (71) in accordance with the offset PTS;

drop processing means (77) that, when the audio drop flag reproduced from the recording medium (71) shows the predetermined value, controls so as not to reproduce an audio frame to be reproduced last in the video object; and

audio decoding means (75 (15, 16, 17)) that performs decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced by the audio data reproducing means and outputs an audio signal.

27. An audio/video reproducing method for reproducing video data and audio data on the basis of a reproduction sequence from a recording medium (71) on which a video object and the reproduction sequence is recorded by a recording apparatus according to claim 22 or 23, comprising:

a first step (S72) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

a second step (S72) of offsetting PTS of an audio frame read from the recording medium (71) in accordance with the audio PTS offset time which is read from the recording medium (71);

a third step (S73) of reproducing video data

reproduced from the recording medium (71) in accordance with video PTS accompanying the video data;

a fourth step (S73) of reproducing audio data reproduced from the recording medium (71) in accordance
5 with the offset PTS;

a fifth step (S74) of, when the audio drop flag reproduced from the recording medium (71) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object;
10 and

a sixth step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced in the fourth step (S73).

15 28. An audio/video recording program for making a computer execute a recording method for, at the time of recording a set of synchronized video data and audio data as a video object onto a recording medium (61),
20 recording a reproduction sequence for connecting and reproducing a plurality of video objects in part or in whole onto the recording medium (61) so that the reproduction sequence can be designated, wherein the program makes the computer execute:

25 a first step of performing encoding including a window function multiplying process and an orthogonal transformation process on an audio signal to be recorded and outputting the audio data;

a second step (S62) of changing the video data as necessary so that a video frame to be reproduced last in a video object and a video frame to be reproduced first in the following video object are reproduced
5 seamlessly at a connection point;

a third step (S63) of determining an edition point in the audio frame so that a period of reproducing an audio frame to be reproduced last in the video object includes time of the connection point of the video frames
10 and a period of reproducing an audio frame to be reproduced first in the following video object includes the time of the connection point;

a fourth step (S64) of calculating time of overlap between the audio frame to be reproduced last and the
15 audio frame to be reproduced first so as to include the connection time;

a fifth step (S65) of, when the connection point is the first connection point in the reproduction sequence, setting the overlap time as audio PTS offset
20 time used at the time of reproducing an audio frame in the video object and, when the connection point is any of the second and subsequent connection points in the reproduction sequence, calculating a value obtained by adding the overlap time and audio PTS offset time at
25 the immediately preceding connection point as audio PTS offset time at the present connection point; and

a sixth step (S66) of recording at least the audio PTS offset time as management information onto the

recording medium (61).

29. An audio/video reproducing program for making a computer execute a reproducing method of reproducing video data and audio data on the basis of a reproduction sequence from a recording medium (71) on which a video object and the reproduction sequence is recorded by a recording apparatus according to claim 22 or 23, wherein the program makes the computer execute:

10 a first step (S72) of resetting a system time clock (STC) of the apparatus so as to seamlessly connect video frames to be connected at each of connection points of the video objects included in the reproduction sequence;

15 a second step (S72) of offsetting PTS of an audio frame read from the recording medium (71) in accordance with the audio PTS offset time which is read from the recording medium (71);

20 a third step (S73) of reproducing video data reproduced from the recording medium (71) in accordance with video PTS accompanying the video data;

a fourth step (S73) of reproducing audio data reproduced from the recording medium (71) in accordance with the offset PTS;

25 a fifth step (S74) of, when the audio drop flag reproduced from the recording medium (71) shows the predetermined value, controlling so as not to reproduce an audio frame to be reproduced last in the video object; and

a sixth step of performing decoding including a window function multiplying process and an orthogonal inverse transformation process on the audio data reproduced in the fourth step (S74).